



ALIST Status

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
for the United States Department of Energy under contract DE-AC04-94AL85000.





Outline

- **Liquid Pumping Considerations**
- **Nozzle design**
- **Available equipment**



Liquid Pumping Considerations

- Poloidal Length: 0.8 m (floor of NSTX)
- Toroidal Length: 0.9 m (1/6 circumference)
- Area of Liquid: 0.7 m² (close to notion of 1 m²)
- Minimum thickness: 2 mm (thermally thick for NSTX exposure time)
- Velocity: 10 m/s
- Flow rate: 17.8 l/s (282 gal/min)
- For supply pipe flow ~ 1 m/s need 2 pipes 4 in dia.



Liquid Pumping Considerations

- Liquid sodium has been used to cool nuclear reactors extensively
- Information from FFTF has shown that considerable vertical head (~30 ft) is needed to provide sufficient suction side pressure for high capacity (100-200 gpm) EM pumps used for sodium.
- Lithium has $\frac{1}{2}$ the density of sodium implying more head is needed.
- Conclusion: the lithium pump cannot be close to NSTX.

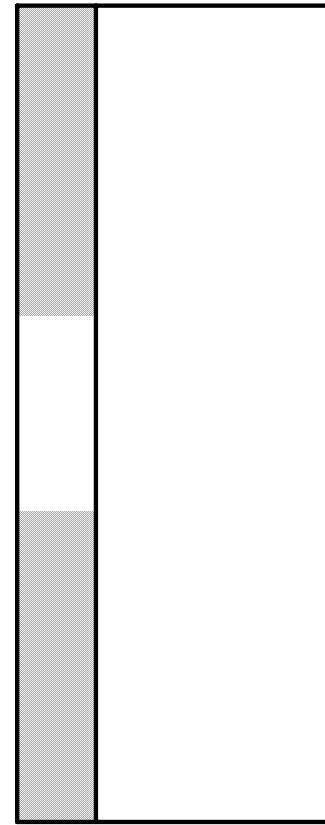


Nozzle design

- **Application of free surface liquids to the NSTX divertor will require closely packed nozzle**
- **High compression nozzles used for neutron generation produce smooth flows but take up too much space for NSTX applications.**
- **Given the success of the 5 mm round nozzle used on LIMITS, we constructed a simple 20 x 5 mm nozzle 2 mm deep**

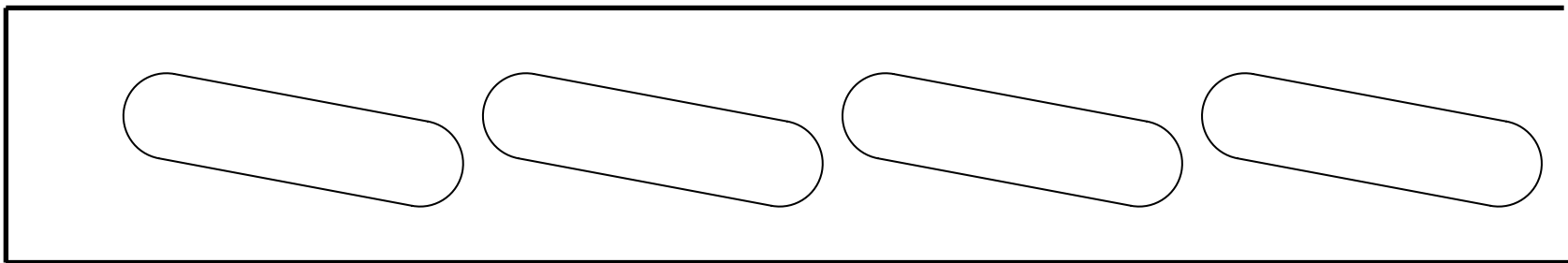


Slot Style Nozzle





Possible Nozzle Configuration





Nozzle design

- **Water testing of that nozzle showed that the liquid under goes one 90° rotation and stays stable for flow distance of about 30 cm with little divergence.**
- **The flow is smooth enough for electron beam thermal testing.**
- **We have built a stainless steel version suitable for lithium operation and will conduct heating tests as soon as our pump is repaired.**



Available equipment

- **A considerable variety of equipment is available from the decommissioning of FFTF**
 - **Flow control valves**
 - **Flow shut off valves**
 - **Electromagnetic Pumps**
 - **Oxygen monitors**
- **We are negotiating transfer of the most useful equipment to Sandia for use on NSTX**
- **The circa 1975 value of this equipment exceeds \$1M.**



Terminology

- **The project to install a flowing liquid lithium divertor surface in NSTX was called ALIST initially**
- **We should stick with that name to avoid confusion about what the goals for the project are**
- **I recommend we drop the module B notation**